



This document contains Charting the Course of the Comprehensive Conservation and Management Plan for Tampa Bay: Monitoring Bay Improvement, Public Involvement, Early Action, and lists of References and Acronyms

The report (tampabay_ccmp_pt7.pdf) can be downloaded from:

<http://www.epa.gov/owow/estuaries/ccmp/documents/tampabay.html>

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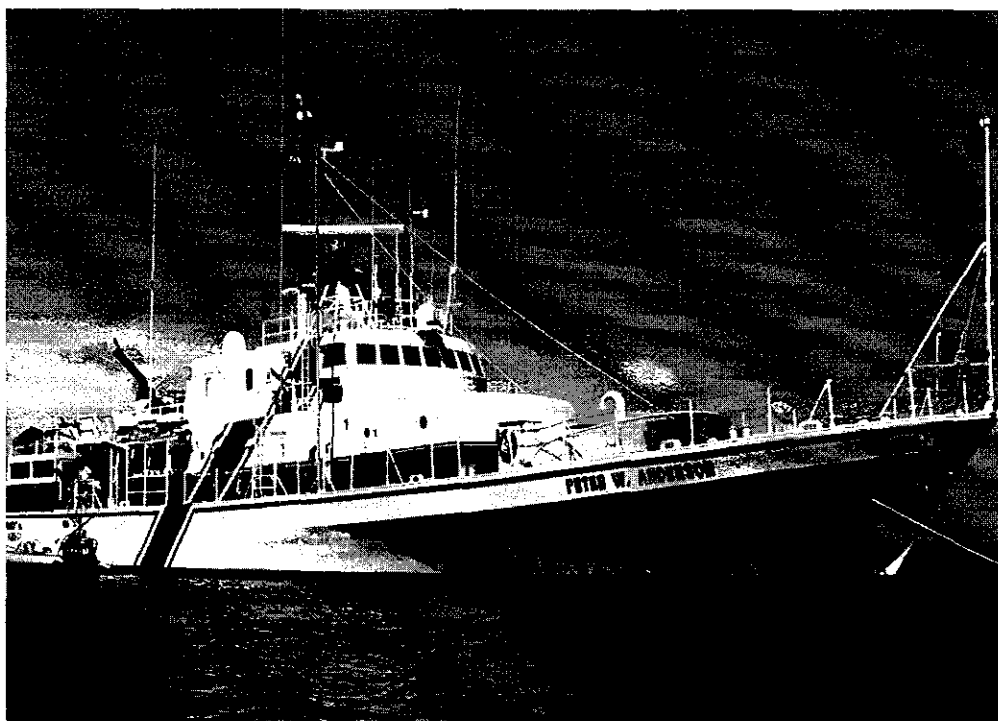


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Monitoring Bay Improvement

Efforts to monitor Tampa Bay's health are central to the success of bay restoration efforts, for monitoring enables communities to measure return on investment and helps environmental managers validate or refocus existing strategies for bay improvement.

An effective monitoring program provides the data necessary to assess the status and trends in the health and abundance of the bay's wildlife and habitats. This information allows local governments and agencies to evaluate progress made in the restoration and protection of Tampa Bay. The data also provides insights into the effectiveness of current management strategies, indicating when goals have been met, if actions should continue, or whether more stringent efforts are warranted.

Monitoring the changes caused by management actions in an estuary is not as simple as counting fish or measuring water quality. Estuaries, by their very nature, are dynamic systems. Populations of fish, birds and other organisms fluctuate with natural cycles. Water quality also varies, particularly as seasonal and annual weather patterns change. The task of tracking environmental changes in an estuary can be difficult —

and distinguishing changes caused by human actions from natural variations can be even more difficult.

The coordinated bay monitoring program devised by the Tampa Bay National Estuary Program (NEP) in cooperation with local governments and agencies is designed to address many of these challenges by building on existing efforts to more fully and clearly assess progress in the bay's recovery.

Tampa Bay benefits from several existing water quality, habitat and fisheries monitoring programs, including an ambient water quality monitoring program conducted by the Environmental Protection Commission (EPC) of Hillsborough County since 1974. These programs have contributed significantly to the wealth of knowledge available on the Tampa Bay estuary.

The monitoring design devised by the Tampa Bay NEP builds on this foundation. Existing monitoring programs have been standardized and expanded in some areas, and new components — to measure atmospheric deposition, bay sediment chemistry and the health of benthic communities — have been added.

A series of workshops with local government and agency partners helped to define five general monitoring objectives for the water quality, fisheries, benthic and habitat components of the program. These objectives are to:

- estimate the areal extent of the bay that does not provide adequate water quality conditions to support seagrasses and other living resources
- assess the abundance and health of bay fish populations over time
- estimate the areal extent of degraded benthic habitat in the bay and within each bay segment
- estimate the areal extent and quality of seagrasses, mangroves and emergent bay wetlands
- estimate the areal extent of oligohaline (low-salinity) habitat in the bay and its tributaries.

This focus on measuring the areal extent of bay conditions expands upon traditional methods and can dramatically increase the value of information collected. For instance, simply considering the average concentration of dissolved oxygen throughout the bay may appear to indicate that water quality standards have been met. But, in fact, this may not be the case, since water quality in some portions of the bay may still be inadequate — or much better than average. The new approach will indicate how much of the bay, by percentage or number of acres, is not meeting water quality conditions to support seagrass recovery targets. It also enables more effective assessment of trends in cases where some areas decline and others improve but the overall condition does not change.

Another new element in the monitoring program for Tampa Bay is an increased emphasis on communicating information in a standard and more meaningful format. Prior to standardization, monitoring programs used various methods to communicate their results. The monitoring framework has been specifically designed to compile and synthesize results from major monitoring programs in a single comprehensive document produced every two years and first published in the Fall of 1996. A separate

summary report will be written for decision-makers responsible for the management of Tampa Bay.

Monitoring workshops will be held every two or three years, allowing environmental professionals from various programs to meet and review findings. A comprehensive report detailing the bay monitoring plan is available from the Tampa Bay NEP.

MONITORING COMPONENTS

The environmental monitoring program for Tampa Bay addresses five components:

1. Water quality
2. Benthos, sediment chemistry and composition
3. Atmospheric deposition
4. Bay habitats (including seagrasses, emergent wetlands and oligohaline areas)
5. Bay fisheries and wildlife.

Two of the monitoring components — for benthos and atmospheric deposition — are new. The monitoring plans for water quality, bay habitats, and fisheries and wildlife build on existing programs. Monitoring costs are covered through the operating budgets of participating local governments.

Components of the environmental monitoring plan for Tampa Bay are summarized below.

HYPOTHESES ADDRESSED

Monitoring results will enable bay managers to assess whether conditions baywide — and by bay segment, in most cases — are improving or declining. The monitoring program for Tampa Bay is designed to answer the following questions:

Water Quality

- Are phytoplankton biomass levels (chlorophyll-*a* concentrations) above, below or consistent with established bay segment targets?
- Are nutrient concentrations increasing, decreasing or remaining stable?
- Is water clarity increasing, decreasing or remaining stable?
- Is the areal extent of low dissolved oxygen concentrations (< 2mg/L) increasing, decreasing or remaining stable?

Benthos

- Is the composition of benthic species changing?
- Are sediment characteristics changing?
- Is the composition of bottom-dwelling finfish changing?
- Are the frequency and spatial distribution of fish pathogens increasing, decreasing or remaining stable?

Atmospheric Deposition

- Are nutrient loads and toxic materials from atmospheric deposition directly to the surface of Tampa Bay increasing, decreasing or remaining stable?

Bay Habitats

- Is the areal coverage of seagrass increasing, decreasing or remaining stable, and how does this compare with baywide restoration/protection targets?
- Is the areal coverage of saltwater wetlands, low-salinity wetlands and associated uplands increasing, decreasing or remaining stable, and how does this compare to baywide restoration/protection targets?

Fish and Wildlife

- Are fish populations increasing, decreasing or remaining stable?
- Are manatee populations increasing, decreasing or remaining stable?
- Are bottlenose dolphin populations increasing, decreasing or remaining stable?
- Are colonial water-bird populations increasing, decreasing or remaining stable?

WATER QUALITY

While current programs measure trends in water quality over time very effectively, they were not originally designed to provide estimates of the spatial extent of conditions in the bay. Four local governments measure water quality at 126 stations in Tampa Bay, including 21 sites in Old Tampa Bay; 23 in Hillsborough Bay; 22 in Middle Tampa Bay; 17 in Lower Tampa Bay; 21 in Boca Ciega Bay; and 22 in the Manatee River and Terra Ceia Bay. These stations were selected to meet the needs of their respective programs and may not entirely satisfy the needs of the baywide environmental monitoring program. To truly determine the extent of conditions reported, stations must be randomly selected.

Samples are measured for dissolved oxygen, phytoplankton biomass (chlorophyll-*a*), water clarity (Secchi depth, photosynthetically active radiation, color, total suspended solids and turbidity), and water column nutrients (nitrogen, phosphorus and organic carbon).

Nearly 70 percent of the 126 original stations have been incorporated into a statistically valid baywide monitoring design. The design is based upon the U.S. Environmental Protection Agency's (EPA) Environmental Monitoring and Assessment Program (EMAP) grid, which allows for random station selection. It enables local governments to continue their long-term study at many stations while providing a more rigorous method to evaluate the spatial extent of conditions in specific bay segments.

The bay's three surrounding counties and the City of Tampa monitor water quality in the bay. These parties have agreed to standardize collection and analysis methods, share data and contribute collated data for the development of the biennial monitoring report. These communities also are participating in the West Coast Regional Ambient Monitoring Program (RAMP), an ongoing effort, initiated by the Tampa Bay and Sarasota Bay NEPs, the Southwest Florida Water Management District (SWFWMD) and local governments to coordinate environmental monitoring data from Tampa Bay

to Charlotte Harbor. All field and analytical methods employed, and QA/QC protocols, are in accordance with approved methods of the EPA and/or the Florida Department of Environmental Protection (FDEP).

BENTHIC COMMUNITIES AND SEDIMENT ANALYSIS

A new component in Tampa Bay's monitoring program was established in 1993 to evaluate the quality of bay-bottom sediments and their effects on bottom-dwelling sea life. Samples are collected annually during an "index" period (September to October) that is representative of worst-case conditions for each year. Collection sites match those randomly selected for water quality sampling.

The benthic monitoring program is evaluating the abundance and composition of benthic species found throughout the bay to identify those areas that differ from expected patterns. Since some species of benthos are more sensitive to environmental stress, these areas may indicate impacts from contaminants, habitat alteration or other trauma.

The health and abundance of benthic organisms are indicators of the bay's overall health. Specific indicators include species richness and diversity, as determined by detailed taxonomic analyses of collected specimens. If contaminants are present in the water column or sediments, filter-feeding benthic organisms and detritivores can accumulate these contaminants in their tissue. They also are an important link in a food web that supports many forms of marine life, and can therefore pass on accumulated contaminants to other organisms that feed on them.

Dissolved oxygen is another indicator scientists use to gauge the health of the bay's benthic communities. Research in nearby Sarasota Bay indicates that stressed seagrass beds may not support the fish and other aquatic life typically associated with healthy grass beds. The lack of sealife may be a result of low levels of dissolved oxygen during pre-dawn hours, an issue that will be addressed in Tampa Bay as an element of the benthic monitoring program.

Sediment quality also is addressed in the benthic monitoring program, in addition to taxonomic and dissolved oxygen measurements. Indicators include chemical content (trace metals) and grain-size analysis.

The benthic monitoring program also calls for local governments to monitor contaminants in sediments as part of their assessments. Initial studies indicate that some areas of the bay contain contaminated sediments, but the severity and spatial extent of contamination in these areas are currently unknown. Beginning in 1996, sediments will be tested for whole-sample toxicity using the Microtox method. In addition, the NEP recommends that the effects of contaminants on benthic life be studied in future years using bioassays that subject test organisms to benthic sediments. Observing the health of benthos exposed to sediment samples in a laboratory will help to identify toxic sites or areas of healthy benthos. Sediment chemistry and toxicity measurements have been designed to correlate with other monitoring programs and allow comparison of toxicity data across the country.

Currently, the bay's three surrounding counties participate in the benthic monitoring program. A field and laboratory methods manual for the Tampa Bay benthic monitoring program, available from the Tampa Bay NEP, details QA/QC protocols. Its methods are based on standard EMAP methodology tested and reviewed by the EPA.

ATMOSPHERIC DEPOSITION

Preliminary research indicates that roughly a third of the nitrogen loading in Tampa Bay, as well as a significant percentage of cadmium, copper and lead, comes from atmospheric deposition directly to the surface of the bay.

In cooperation with EPA's Great Waters initiative, local air and water quality divisions, as well as SWFWMD, the FDEP and the Florida Department of Transportation (FDOT), are participating in a long-term monitoring program for local atmospheric deposition. The 18-month daily sampling effort, which began in August 1996, is designed to assess atmospheric contributions of nitrogen to Tampa Bay by measuring rainfall and dryfall, according to procedures and protocols established by the National Atmospheric Deposition Program (AIRMn) and peer-reviewed by researchers from National Oceanographic Atmospheric Administration's (NOAA) Air Resources Laboratory.

In addition to the intensive single-site Great Waters wetfall/dryfall deposition monitoring, the Tampa Bay NEP has recently completed a pilot program to examine the spatial variability of atmospheric deposition. Nutrient and heavy metal loadings from atmospheric deposition at seven sites were measured in the Tampa Bay watershed. Pesticides (including DDT) and other organic pollutants also were measured at selected sites. Weekly samples were monitored for levels of copper, lead, zinc, nitrates and phosphorus. Mercury, which also is associated with atmospheric deposition, is being monitored under a separate program through the FDEP. The pilot program will provide new insights into the distribution of contaminants transported by rainfall and dustfall.

BAY HABITATS

The amount and quality of habitat available for fish and wildlife is critical to maintaining and restoring Tampa Bay. Many species have specific habitat requirements that must be met for their survival.

Ongoing monitoring efforts have demonstrated recovery of seagrasses in some areas of the bay. SWFWMD maps seagrass beds using aerial photographs taken every two years and verifies the data with field checks gathered from 60 randomly selected sites, providing an important indicator of the success of seagrass recovery. The health of seagrasses in randomly selected areas also is monitored every two years by measuring density of plants, the number of blades per plant and the relative density of epiphytic algae attached to the grass blades. More frequent monitoring may be required if significant declines in seagrass coverage or health are noted in the future.

The City of Tampa conducts more detailed seagrass monitoring in Hillsborough Bay.

Low-salinity or oligohaline habitats along tributaries (where salinities range from 0-10 parts per 1000) are critical for juvenile fisheries. The boundaries of these habitats fluctuate with the flow of fresh water in natural cycles. These habitats have been hard-hit by development and diversions of fresh water to serve the region's potable water needs.

Until recently, few efforts had been made to quantify the loss of low-salinity habitats, but new studies by regional and state agencies have mapped these wetland areas and

provided salinity measurements from area rivers. Separate studies by SWFWMD, conducted as part of their minimum flow permit requirements, will determine the effects of changes in freshwater inflows to Tampa Bay, including impacts to fisheries and other aquatic life. Responsibility for long-term monitoring of oligohaline habitats has not yet been assigned.

FISH & WILDLIFE

Fish and wildlife in the Tampa Bay region have declined sharply over the past 30 years. Activities to document their resurgence as new bay management practices are implemented will be necessary to maintain ongoing support for bay restoration.

The FDEP's Critical Fisheries Monitoring Program, established in 1990, provides the most comprehensive sampling of fisheries in the bay. This program, conducted by FDEP's Florida Marine Research Institute (FMRI), employs stratified random and fixed-station monitoring to assess the abundance and distribution of the bay's fish and macroinvertebrates.

To monitor potential environmental effects from toxic or hazardous materials, the Tampa Bay NEP has recommended that the program be expanded to document abnormalities in all fish over 75mm long, including tumors, parasites, skeletal malformations and deformities in the gills, mouths and eyes. The largest five fish in each target species also would be analyzed for chemical contaminants.

FDEP also monitors the numbers of endangered sea turtles, manatees and bottle-nose dolphins in Tampa Bay with aerial surveys conducted annually over nearshore waters. Data collected includes location, species, number of adults and calves and animal behavior.

The bay's colonial breeding bird populations are monitored by Audubon Society's Tampa Bay Sanctuaries, which conducts an annual ground survey and census at island nesting sites in the region. Audubon also sponsors an annual Christmas count, dispatching teams of volunteers to various places to note numbers and varieties of birds. Aerial surveys of pelicans and mid-winter surveys of waterfowl are conducted by Florida's Game and Fresh Water Fish Commission annually throughout the state. In the future, it may be beneficial to establish specific goals for populations of colonial waterbirds and nesting birds, as additional measures of the overall health of the bay.

DATA MANAGEMENT AND ANALYSIS

To facilitate data sharing, monitoring data will be available through a decentralized system maintained by the Florida Growth Management Data Network Coordinating Council located in the Governor's office in Tallahassee.

In this system, participants check, verify and maintain their own databases, often in a variety of physical locations using various software and hardware. The Council has developed a central subject directory (CSD) for Tampa Bay to allow users to easily and rapidly access data. The CSD was created from an existing computer database as an element of the Council's statewide directory.

Agencies collecting data agree to submit entries to the CSD describing their in-house databases; meet minimum standards for in-house data documentation; and routinely

provide this documentation when transferring data. Agencies maintaining water quality databases must periodically submit their monitoring data to Florida's STORET system. Use of the STORET system ensures that the water quality data will be stored securely and available to a wide variety of users nationwide.

MONITORING PERFORMANCE

Performance criteria are explicit levels of environmental change that may be detected through monitoring. These criteria, and periodic evaluations of how well the program meets those criteria, will ensure that the sampling intensity is appropriate to the level of change anticipated as a result of management actions. For example, infrequent sampling could result in a monitoring program incapable of detecting anything but catastrophic change. Extensive sampling, on the other hand, may unnecessarily waste resources to measure changes of little importance. Water quality and habitat monitoring will allow comparisons of bay conditions to established targets for bay restoration and protection. The sampling regime has been designed to detect spatial and temporal changes at meaningful ecological scales. Biological monitoring will evaluate whether water quality and habitat enhancements are providing a suitable environment for healthy populations of plants and animals. Statistical power analysis will be used every 2-3 years, or as needed, to modify the monitoring programs.

EVALUATING PROGRESS

Participants in the Tampa Bay monitoring program recognize that monitoring efforts are only as good as their ability to get current and accurate data to appropriate managers in a timely manner. A bay monitoring report, first published in 1996 by the NEP, incorporates data from various governmental agencies and communities into a common format. Information for the biennial report will be compiled by SWFWMD, using in-house resources for data analysis and presentation.

A key objective of the report is to assess progress toward achieving restoration and protection targets set forth in the Comprehensive Conservation and Management Plan (CCMP) for the scientific community and general public both.

The format includes updated environmental data focusing on both status and trends within Tampa Bay and its watershed. The report also highlights areas where additional management actions may be needed as an early warning system for local and state governments responsible for maintaining the environmental integrity of Tampa Bay. Finally, the report provides a periodic assessment of the effectiveness of monitoring efforts, enabling managers to modify elements as needed to meet program objectives and goals.

In addition to monitoring the bay's vital signs, efforts also will be directed to monitoring the success of specific actions or outreach efforts. For example, while it may be impossible to measure impacts to water quality resulting from reduced use of fertilizer in the watershed, public awareness and practices can be measured using public opinion polls or by evaluating product sales at retail outlets. A monitoring component is included with each individual action presented in *Charting the Course*.

A comprehensive review of the goals and strategies for bay restoration will be conducted every five years.

Research Priorities for Tampa Bay

Technical advisors to the Tampa Bay NEP have identified several research priorities for the bay to be pursued as funding becomes available. They are to:

- Continue research on the impact and sources of atmospheric deposition.
- Determine the impacts of changes in freshwater inflow on oligohaline habitats.
- Investigate the effects of toxic contaminants on fish and wildlife in key areas such as McKay Bay.
- Continue identification of sources of sediment contamination.
- Evaluate potential for contamination of wildlife (fish and birds) feeding in stormwater ponds.
- Identify causes of sediment resuspension and non-chlorophyll *a* turbidity.
- Determine the need and best locations for regional stormwater facilities.
- Identify light requirements for seagrasses in all bay segments.
- Determine the extent and natural and anthropogenic sources of hypoxia.
- Evaluate the cost-effectiveness of pollution prevention programs such as the Florida Yards & Neighborhoods Program.

Other research needs identified by the NEP's Technical Advisory Committee focus on:

- Determining minimum widths for vegetated buffers.
- Assessing anthropogenic influences on the duration of red tide.
- Continuing research on experimental seagrass transplanting techniques and suitable sites.
- Assessing the impacts of thermal discharges.
- Assessing the distribution and abundance of oyster reefs and other shellfish resources in Tampa Bay, and evaluating alternative methods of assessing public health concerns.
- Assessing the threat of invasive exotic species entering the bay in ship ballasts.
- Assessing the need for zooplankton monitoring.
- Assessing filling of deep dredged holes in the Palm River and other dredged channels.
- Assessing evaluation techniques used for determining public health issues.

CHARTING
the **COURSE**
FOR TAMPA BAY

Public Involvement

A well-crafted community outreach program that enlists and involves diverse interests as partners in bay restoration and protection is a hallmark of all successful National Estuary Programs.

This principle has guided the Tampa Bay National Estuary Program (NEP) since it was established in 1991. A public opinion poll conducted for the Program that year found citizens generally were willing to pay more to restore the bay—but wanted assurances that current programs “work smart” to effectively apply existing regulations and resources before adding new mandates. Responses also indicated that citizens didn’t fully understand the bay’s most pressing problems, or how actions at home impact the health of the bay.

Survey results confirmed the need for diverse public input in developing the Comprehensive Conservation and Management Plan (CCMP) for Tampa Bay. Findings also pointed to the need for a broader campaign to educate the community about the bay and foster public stewardship of this environmental and economic resource.

These findings became the springboard for a Community Advisory Committee established by the Tampa Bay NEP in 1991. Composed of citizens with diverse perspectives and backgrounds from the bay’s three surrounding counties, the 25-member forum has provided structured input from people who share a common interest in a healthy bay. Advisors are appointed by the NEP’s Policy Committee and include residents and representatives of agriculture, industry, education, fishing, and environmental experts and activists, who also share their perspectives as citizen-taxpayers. Members also provide information to constituents and help design and execute community outreach programs.

This chapter profiles key elements of the NEP’s public education and involvement efforts and recommends ways to maximize community participation in the future. It also details public participation in the development of the CCMP and concerted efforts to solicit feedback on the draft plan released in January 1996.

Addressing the Bay’s Priority Problems

Priority issues, such as stormwater runoff and seagrass protection, have provided a focal point for educational outreach.

Studies by the Tampa Bay NEP estimate that stormwater runoff contributes about half of the bay’s total nitrogen input and significant amounts of heavy metals and pesticides. Yet fewer than half of the citizens responding to a public opinion poll on Tampa Bay in 1991 were able to identify stormwater runoff as a major source of bay pollution.

Even fewer recognized their own potential contribution to stormwater pollution. In fact, while most residents believe businesses are the major source of bay pollution, residences — which far outnumber commercial sites — actually contribute more to the bay's total nitrogen input. And that contribution could grow as more people move into the region.

Yards & Neighborhoods as Pathways to the Bay

Yards and neighborhoods are one of the bay's first lines of defense against pollution in stormwater runoff. Nevertheless, many homeowners fail to understand the potential impact of excess fertilizer, pesticides and water used in landscape care on the long-term health of Tampa Bay. The connection may be immediate in a waterfront neighborhood, or gradual, through the flow of stormwater drains, ditches, streams or rivers.

To publicize these concepts and enlist residents in pollution prevention, the National Estuary Programs of Tampa Bay and Sarasota Bay and the Florida Cooperative Extension Service established the Florida Yards & Neighborhoods (FY&N) Program in 1991. Experts from county extension services, which administer the program, teach residents ways to reduce runoff pollution and enhance their environment by improving home and landscape management. The program promotes the establishment of Florida Yards, which emphasize native and other beneficial plants that blend beauty and environmental benefits. The program also emphasizes least-toxic techniques for landscape maintenance to reduce pesticides in runoff to the bay.

In 1994, the West Coast Regional Water Supply Authority joined the FY&N founding partners in a move to expand the program in Hillsborough, Pinellas, Pasco and Manatee counties. Participating neighborhoods learn and apply environmental landscaping techniques and other pollution prevention practices. To advance these concepts, the FY&N Program has produced a number of educational tools, including a Florida Yards & Neighborhoods handbook, a Florida YardStick poster which helps homeowners measure progress in improving the environmental quality of their landscape; and various slide shows and newsletters.

Actions presented in *Charting the Course* seek to expand these efforts and reach more people by further enlisting retailers, developers and landscaping professionals, as well as other non-profit educational groups, to promote FY&N concepts. Local governments also are called upon to lead by example by landscaping and maintaining public properties in accordance with these environmental principles. These groups can help stimulate consumer demand for Florida Yards that are less maintenance-intensive, resulting in reduced pesticides and fertilizers in runoff to the bay.

Educating Boaters to Protect Seagrasses

Seagrass protection has been another educational priority of the Tampa Bay NEP. Studies estimate that roughly one-third of the bay's seagrasses are moderately to heavily scarred as a result of prop scarring by boats that cut through shallow grass flats or dredge their way free after running aground. Intense scarring at several bay locations, including Weedon Island Preserve, Cockroach Bay and Ft. DeSoto Park, has led to boating restrictions and an increased emphasis on boater education.

To promote protection of seagrasses and other vital bay habitats, the Tampa Bay NEP and the Florida Department of Environmental Protection (FDEP) published a Boater's Guide to Tampa Bay in 1992. While bay stewardship is the central theme of the guide, the guide's strength is that it features helpful boating information in a handy format that invites use. The guide's focal point is a 34"-by-22" color chart of Tampa Bay that identifies ship channels, seagrasses, aquatic preserves, reefs and public boat ramps. The chart's flip side features profiles and illustrations of native habitats, manatees and birds of the bay. It folds to 9"-by-4" standard road map size for easy on-boat storage and is available in both water-resistant and recycled stocks.

More than 100,000 Boater's Guides have been distributed to boaters locally through marine patrol units, marinas, tax collector's offices, local agencies and special events. FDEP, which is using the Tampa Bay guide as a template for the development of boater's guides throughout Florida, has since produced six additional boaters guides in a statewide series.

The Tampa Bay NEP also produced a series of high-quality interpretive signs for installation at more than a dozen high-use boat ramps and waterfront parks along the bay. The set includes a master sign featuring a map of the Tampa Bay estuary and seagrass areas, and companion signs on various bay wildlife and habitats.

Enlisting Volunteers for Bay Improvement

The Tampa Bay NEP has been instrumental in supporting volunteer efforts for bay restoration and protection. In 1993, the Program helped establish a Bay Conservation Corps under the direction of Tampa BayWatch, a non-profit bay stewardship group. Since then, BayWatch has enlisted more than 3,000 citizens for dozens of bay improvement projects, including salt marsh plantings, bird island cleanups and an award-winning wetland nursery program with area high schools (see profile in Community Partnerships below). The organization serves as a clearinghouse to match interested volunteers with hands-on activities around the bay sponsored by various agencies and communities.

The Southwest Florida Water Management District's (SWFWMD) Surface Water Improvement and Management (SWIM) program, and numerous other community organizations, also utilize volunteers for bay restoration efforts.

Since 1993, the Tampa Bay NEP and BayWatch have hosted an annual Great Bay Scallop Search, in which teams of volunteers don snorkels, masks and fins to comb seagrass beds in search of the elusive bay scallop. The scallop disappeared from Tampa Bay in the 1960s when the bay was badly polluted. Improved water quality and seagrass conditions have rekindled hope that the bay can once again support a self-sustaining scallop population. Experimental stocking efforts, initiated several years ago, are being evaluated.

Developing Community Partnerships for Bay Restoration

A Bay Grants program established by the Tampa Bay NEP in 1992 has been an important catalyst in developing community partnerships for bay restoration. Since then, the

NEP has awarded over \$50,000 in small grants to more than a dozen organizations, schools and communities for projects to educate and involve citizens in bay improvement. These initiatives have leveraged the talents and resources of numerous organizations, maximizing the community's return on investment and benefits to the bay. Profiles of projects and partners are provided below.



Tampa Bay Docents—An NEP grant helped The Florida Aquarium establish a Bay Docents program in 1993 to train interested volunteers to lead weekend BayWalks on Tampa Bay at Tampa's McKay Bay Nature Park and Weedon Island Preserve in Pinellas County. The Program has since trained more than 30 guides and introduced hundreds of children and adults to the bay's coastal ecosystems. Docents must complete a class and field course conducted by The Florida Aquarium, and commit to leading a minimum of six BayWalks per year. BayWalks are now a permanent component of the aquarium's community programming, providing an excellent model for other communities.



Operation BayWorks—This Hillsborough County project assists businesses in developing and implementing pollution prevention plans to reduce stormwater runoff. The pilot in 1995 and subsequent workshops have attracted nearly 100 businesses from targeted industry sectors, including landscape maintenance, construction and automotive repair. Participants receive pollution prevention workbooks designed specifically for their industries, along with instructional and promotional literature. The program will be evaluated for implementation in other watershed counties.



Coastal Wetland Nursery Program—With funding from the NEP, Tampa BayWatch enlists high school ecology clubs in cultivating wetland plants for coastal restorations. The initial NEP grant financed the construction of a wetland nursery at St. Petersburg's Lakewood High School, where students cultivated and transplanted more than 2,000 salt marsh plants, and development of an instructional guide to assist other interested high schools. The idea is taking root at other bay area schools and BayWatch eventually hopes to produce about 75,000 salt marsh plants each year to aid in local restorations.



Eco-Landscaping for Businesses—Businesses are beginning to appreciate the bottom-line benefits and beauty of native Florida landscapes, which require less water, fertilizer and pesticides, thanks to an educational campaign led by the Tampa Audubon Society in cooperation with the Florida Association of Environmental Professionals, Westshore Alliance, Lewis Environmental Services and the Tampa Bay NEP. A \$4,500 grant to the Tampa Audubon Society assisted in the development of a corporate "pitch" brochure and slide show that highlights cost-savings and environmental benefits. The group will target large commercial developments where landscape modifications may be cost-effective, as well as urban and landscape designers involved in planning new commercial projects.



Least-Toxic Pest Controls—The effectiveness of natural predatory insects as an alternative to pesticides was tested in a six-month trial using various ornamental crops, under the direction of the Manatee County Cooperative Extension Service. Results showed important cost and labor savings, in addition to environmental benefits associated with reduced pesticide use. Workshops also were conducted to promote least-toxic pest management techniques to nurserymen and growers.



Emerson Point Restoration—Volunteers led by the Manatee County Soil & Conservation District teamed up to restore severely damaged mangroves and salt marshes at this conservation site. The project also produced a plant and conservation guide to Emerson Point and neighboring Terra Ceia Aquatic Preserve.



Egmont Key Seagrass Protection—Navigational buoys were installed by the Egmont Key Alliance at this popular coastal barrier island to deter boat traffic from heavily scarred seagrass beds. Interpretive signage on the island educates boaters about the importance of protecting these vital grassbeds.



Model Florida Yard Landscaping Demonstration—This project by Hillsborough County's Public Utilities Department involved the design and installation of a low-maintenance Florida landscape and interpretive signage at northwest Hillsborough's Austin Davis Library, where visitors can learn about and view bay-friendly landscape concepts that can be applied at home.



Shell Key Bird Nesting Protection—The St. Petersburg Audubon Society received a \$500 grant from the Tampa Bay NEP to develop an educational sign for installation at this important bay bird nesting site to educate visitors about the island's feathered inhabitants.

A special community partnership between the Tampa Bay NEP and The Florida Aquarium was formed in 1995 to support development of a Florida Landscapes exhibit at the entrance to the aquarium. This living exhibit features a mosaic of native habitats, from beaches and wetlands to wildflower gardens, along with interpretive signage that promotes the environmental benefits of native landscaping. Funding from the NEP also supported educational programs to promote Florida Yard concepts and will be used in 1997 to develop an interactive software kiosk on Tampa Bay for visitors.

Outreach to Schools

Fostering an environmental ethic among students, who represent the region's future decision-makers, is particularly important.

Through partnerships with local school districts and The Florida Aquarium, the Tampa Bay NEP has sponsored field trips and workshops for several thousand area students and hundreds of instructors. Most recently, the NEP and the Tampa Tribune produced a six-unit curriculum kit on Tampa Bay for middle school students in the Tampa Bay area.

Junior-high and high school students participated in outdoor learning labs at Cockroach Bay, McKay Bay, Emerson Point and Weedon Island. The NEP targeted younger schoolchildren with performances by the Marine Gang, a group of costumed sea creatures whose creative mix of music and theater bring the bay to life on stage. With support from the Tampa Bay NEP, the Marine Gang introduced more than 65,000 elementary school students to the wonders of the estuary and kid-friendly tips for pollution prevention. The Marine Gang is administered through the Museum of Science & Industry, which continues to offer the program to schools and community groups thanks to funding from the SWFWMD.

Charting the Course for Tampa Bay

COMMUNITY INVOLVEMENT IN THE DEVELOPMENT AND REVIEW OF THE BAY PLAN

The Tampa Bay NEP has brought together diverse sectors of the community as partners in the development of the plan for Tampa Bay. This effort began in 1991 with the establishment of the Community Advisory Committee and continued in 1996 with increasingly focused efforts to expand public participation in the plan's review and finalization.

What you had to say

Hundreds of residents and representatives of local governments, agencies and organizations shared their views with the NEP on the proposed management plan for Tampa Bay. The Spring 1996 issue of Bay Guardian, the NEP's quarterly newsletter, recaps public response and some of the most frequent questions NEP received. Comments from the community were overwhelmingly positive, especially regarding goals for nitrogen management, seagrass recovery and habitat restoration. Citizens gave particularly high marks to the NEP for the writing and organization of the plan, which they say facilitated their review and understanding of the issues.

However, some residents were dissatisfied that the Tampa Bay NEP did not take a formal position against Florida Power & Light Company's request to burn a controversial Venezuelan fuel called Orimulsion at its Parrish plant in Manatee County. This would have added an additional 20 tons of nitrogen to the bay each year, unless steps to mitigate for those impacts had been required.

Despite a recommendation for approval from the state hearing officer and the FDEP, the Governor and Cabinet voted in April 1996 to deny the utility's request, citing unresolved public concerns about increased nitrogen oxide (or NOx) loadings to the bay, traffic impacts and the adequacy of spill response capabilities. The decision has been appealed. The Tampa Bay NEP provided depositions in the case emphasizing the need to cap nitrogen loadings at existing levels, based on preliminary water quality modeling analyses. Nitrogen loading goals for Tampa Bay were finalized and approved in June 1996.

An early outline of the five environmental action plans presented in *Charting the Course* was developed and presented for review in January 1995. Additional research and more than 200 responses from technical and citizen advisors were instrumental in shaping the draft bay management plan, released in January 1996 and now finalized for adoption.

Since the release of the draft plan, the Tampa Bay NEP has received hundreds of written comments from residents and agency and government partners. More than 250 citizens attended a series of four Town Meetings on Tampa Bay during February and March 1996 to discuss the bay restoration blueprint with panels of experts from their communities. The forums were co-sponsored by the League of Women Voters and rebroadcast extensively on local government and cable channels.

The NEP and its Community Advisory Committee also hosted a series of eight smaller focus groups to obtain feedback from specific interests, such as farmers, anglers, developers, the maritime community and residents. Community focus groups also played an important part in developing strategies advanced in the plan. These focus groups have helped to strengthen community investment in the bay plan and have assisted the NEP in understanding the concerns of key constituent groups.

A special 12-page newspaper supplement on *Charting the Course* distributed to more than 700,000 area residents through local newspapers in April of 1996 further enlisted interest and comments from the community. The news tab also was distributed through local libraries, bookstores, area attractions and government offices.

Planning for the Future

Local communities and agencies participating in the Tampa Bay NEP will sign an agreement in early 1997 accepting specific responsibilities for implementing the bay master plan. As attention shifts from planning to implementation, the focus of public involvement and education also will shift to address long-term but vitally important needs.

Future outreach to the community should seek to:

- foster continued community support for bay restoration and implementation of the CCMP by continuing to educate citizens on bay issues and publicize the bay's progress and needs;
- improve public faith in the ability of bay managers and organizations dedicated to its restoration and protection to "work smart" to leverage resources, avoid duplication and focus on priorities;
- maximize direct opportunities for public involvement in bay restoration and environmental improvement.

These objectives are part of an action plan on Public Education and Involvement (see Action Plans) developed in 1996 by the NEP and its Community Advisory Committee. The committee's recommendations will help guide the NEP as it oversees implementation of the bay masterplan.

CHARTING
the COURSE
FOR TAMPA BAY

Early Action

Since its inception, the Tampa Bay National Estuary Program has secured almost \$1 million in matching grants and federal funds for early action projects designed to jump-start restoration efforts and build community support for the bay's recovery.

These diverse projects have allowed researchers to test new techniques and concepts for reducing pollution and restoring degraded habitats; identify and fill in gaps in current protection programs; and educate bay area citizens about threats facing the bay — and how they can help overcome them. Several of these key early action initiatives are summarized below:

Cockroach Bay Restoration

This secluded inlet on Tampa Bay's southeastern shore harbors some of the most productive mangrove forests and seagrass meadows in the entire bay system. However, the long-term health of this area has been jeopardized by intensive alteration of its upland fringe, primarily from agricultural and mining operations.

The Tampa Bay NEP, together with regional and state agencies providing matching funds, secured \$700,000 in federal grants to assist in the restoration of this area — \$300,000 from the Coastal America Program and \$400,000 in grants under Section 319(h) of the federal Clean Water Act. The effort is part of a \$2.6 million restoration directed by the Southwest Florida Water Management District's (SWFWMD) Surface Water Improvement & Management (SWIM) Program, in cooperation with Tampa Bay NEP and more than a dozen other public and private-sector partners. Hillsborough County spent \$2.1 million to purchase the restoration site, while SWFWMD-SWIM has dedicated or spent more than \$1.1 million to date for design, permitting and construction of the project's first phase.

The 500-acre project is the largest saltwater restoration of its kind conducted in Florida. The project is unique in its multi-faceted focus on creating a mosaic of habitats, including brackish and freshwater marshes, grass beds, oyster and live-bottom reefs, salt barrens, and upland pine and hardwood forests. In addition, the project will provide much-needed treatment of stormwater runoff from the surrounding farmlands by building a treatment pond in which runoff will be filtered before being discharged naturally to a restored stream bed leading to the bay.

Removal of exotic vegetation such as Brazilian pepper already has been partially completed, and the tidal stream restoration accomplished. Construction of further stormwater improvements began in 1996.

Bay Scallop Recovery

The bay scallop was once a common resident of Tampa Bay, but virtually disappeared in the mid-1960s. Many scientists blame declining water quality for the scallop's demise and speculate that the dramatic improvements now occurring in the bay's health may offer hope for restoring bay populations of these sensitive mollusks.

The Tampa Bay NEP has contributed more than \$130,000 to research aimed at pinpointing the water quality conditions necessary to support bay scallops and to aggressively restock suitable bay segments with scallops. That effort, directed by the University of South Florida, has so far raised more than a million juvenile scallops in laboratories, using strips of artificial turf that mimic the seagrasses to which the scallops cling in the wild. Hundreds of thousands of these juvenile scallops have been released in lower Tampa Bay, and monitoring is underway to determine whether these exploratory transplant efforts can help bring back a sustainable scallop population.

Gandy Shoreline Alternatives

Construction of vertical seawalls along the bay's borders has destroyed much of the bay's sloping fringe of ecologically valuable mangroves and salt marshes. This project, financed with \$65,000 from the Tampa Bay NEP, tested different techniques for "softening" seawalls along the industrialized southeast shoreline of the approach to the Gandy Bridge. Funds from the Tampa Bay NEP were matched with about \$150,000 from partners in the Bay Area Environmental Action Team (BAEAT), including SWIM, which implemented the project.

The project evaluated structurally sound and environmentally friendly alternatives to seawalls that enhance habitat values while still providing protection of upland properties. Methods evaluated included: lowering the elevation of the original seawall to create a gentler slope and installing riprap to allow tidal flushing and pools for juvenile fish; planting salt marsh grass behind the riprap to stabilize the shoreline; adding riprap to both ends of a remnant seawall offshore to provide habitat for oysters and crabs and to create a small lagoon behind the structure; and installing "MacBlox," cement blocks with scalloped contours and multiple openings that provide more surface areas for oysters, barnacles and fish to utilize.

Information gleaned from this project, which was completed in 1993, gave officials insight into how to design more ecologically benign shoreline stabilization structures. Techniques evaluated by the project are now being recommended by regulatory officials for commercial and residential use.

In addition to the seawall studies, the project also restored the littoral marsh and mangrove habitat upland of the seawall, constructed a boardwalk, and installed signs describing the restoration and the seawall alternatives demonstrated there.

Pepper Busters Brochure

Brazilian pepper is the most invasive and persistent of the exotic plants to gain a foothold along Tampa Bay. This tall shrub quickly moves into disturbed shoreline areas, strangling mangroves and forming a dense monoculture that provides little ecological benefit and is extremely difficult to eradicate.

The Tampa Bay NEP funded a \$3,000 project by the Cockroach Bay Aquatic Preserve Management Team (CAPMAT) and the South Hillsborough Pepper Patrol to create an illustrated brochure explaining the environmental hazards of this plant and how to get rid of it. It also explained the importance of preserving native plant communities. This popular brochure, one of the first of its kind written for the general public, is widely distributed by county and state environmental agencies, county extension agents and public libraries.

Assessment of Management Efforts to Protect Seagrass

Propeller scarring of seagrass beds in Tampa Bay is widespread and impairs the ability of these underwater meadows to protect against erosion and provide habitats for marine life. This project, financed in part with \$14,000 from the Tampa Bay NEP, enabled Pinellas County to assess the extent of seagrass scarring in a section of the bay through aerial mapping and interpretation and to evaluate various methods of protecting those seagrasses from further damage.

The site chosen for the project encompassed 420 acres of severely scarred seagrass around Fort DeSoto Park in Pinellas County, in a large embayment called Boca Ciega Bay. Scarred areas were mapped in March and October 1993, in October 1994 and again in December 1995. Mapping will continue annually for three more years.

After examining results of the baseline survey, two protection zones were established in the seagrass beds. A "caution zone" allows boats to enter under power as long as they don't damage seagrass beds. This directive is enforced by Sheriff's marine officers. A second "restricted zone" prohibits use of internal combustion engines within the area, although boaters may pole or drift in. The seagrass scarring was virtually the same for both the closed and restricted-access areas, indicating that signs alone may be effective deterrents to seagrass scarring and that complete closures may not be necessary to reduce propeller scarring.

This project is providing important information about what protective measures are effective in reducing seagrass scarring, and may help bay managers develop uniform, easily recognizable guidelines that can be implemented throughout not only the bay, but also the entire state.

Data-Sharing Through GIS

Tampa Bay is among the most well-studied waterways in the nation, yet valuable information from research and monitoring projects is not always shared among bay managers. This occurs often because the data bases and formats used by the agencies are incompatible with each other.

Maps are a particularly important and visible management tool, with their ability to relate a vast amount of information, including land uses, natural resources, drainage patterns, pollution sources and political boundaries. This project, supported with nearly \$20,000 from the Tampa Bay NEP, enabled the Environmental Protection Commission (EPC) of Hillsborough County to create a comprehensive, readily retrievable data base for the bay based on computer-generated maps utilizing Geographic Information System (GIS) technology.

Cockroach Bay was selected as a testing ground for this innovative approach. Officials with the EPC compiled information about Cockroach Bay from various sources and imported those files into their data banks. They then produced GIS maps that synthesized the information in a format compatible with other agencies, government organizations and research institutions. These techniques will be expanded bay-wide, providing across-the-board information that will result in less duplication and promote greater cooperation among bay managers in the future.

Seabird Rescue Initiative

Although Tampa Bay has largely been spared the damaging effects of major oil spills, those that have occurred have pointed to the need for a trained corps of volunteers to rescue and rehabilitate injured wildlife, especially seabirds.

In conjunction with the Pinellas Seabird Rehabilitation Center and the Tampa Bay Regional Planning Council, the Tampa Bay NEP contributed \$7,500 to finance the organization and training of nearly 100 citizen-volunteers to assist in seabird rescue efforts, in addition to the production of a volunteer training manual. Beginning in October 1991, the volunteers attended several seminars featuring leading wildlife rehabilitators; the group also received rescue kits, nets and communication equipment.

In August 1993, more than 330,000 gallons of oil and jet fuel were spilled in the bay when two barges and a tanker collided near the Sunshine Skyway Bridge. The seabird rescue teams put their training to good use, rescuing and treating 361 birds at a temporary "hospital" at Fort DeSoto Park. Eventually 310 birds, or 88 percent, were recovered and released — an extraordinary success rate when compared to similar efforts in other regions. The advance planning, organization and chain-of-command structure demonstrated by this network serves as a model for similar groups throughout the nation.

Emerson Point Project

Emerson Point is a historically and ecologically rich coastal area at the mouth of the Manatee River. The cultural resources of the 195-acre site include American Indian mounds and middens that were studied by researchers with the Smithsonian Institution, and the remains of a 19th century plantation. Natural resources include extensive hardwood hammocks, mangroves and saltmarshes, as well as colorful and rare live-bottom reefs in the shallow waters offshore.

The Tampa Bay NEP provided \$50,000 to Manatee County to aid in the protection and restoration of this area, which was purchased by the state in 1991 and is now managed by the County as Emerson Point Park. The project focuses on providing public access to the site for education and recreation, while preserving its unique cultural and natural attributes. Work includes removal of exotic vegetation, excavation and stabilization of the Indian mounds and plantation, and the construction of boardwalks and trails for public access. Signs will be posted to describe the land, its human and natural history and resident wildlife, and plans are now underway to develop a county environmental education center on the site to teach schoolchildren about this priceless ecological and historical heritage.

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NON-POINT SOURCE POLLUTION - refers to pollution that comes from many sources and cannot be traced to one specific point, such as pollution from stormwater runoff and the atmosphere.

OLIGOHALINE - refers to water with a very low salinity (salt content), ranging from 0.5 to 10 parts per thousand (ppt). Fresh water is characterized by salinity of less than 0.5 ppt; sea water contains about 35 ppt.

PHYTOPLANKTON - free-floating aquatic plants and plant-like organisms, usually algae; an important food source for many animals.

POINT-SOURCE POLLUTION - refers to pollution that comes from a specific source or point of origin, such as a discharge pipe or outfall.

RUNOFF - water from rain or irrigation that flows over land. Runoff often carries pollutants such as oils, fertilizers and pesticides and is frequently a major component of non-point-source pollution.

SALT MARSH - a marsh growing in the intertidal and upper coastal zone, where salt water from the sea has a strong influence on the types of plant life. Salt marshes are important wetland habitats for many kinds of fish and wildlife.

SEAGRASSES - true flowering plants (not grasses) that grow underwater in shallow bays and estuaries. Seagrass meadows provide food and refuge for many marine animals.

SHELLFISH - a generic term that includes both crustaceans and mollusks, especially those used for food. The term finfish, by contrast, refers to true fishes.

SPOIL - sediments removed during dredging. Spoil may be deposited underwater or on islands created specifically for spoil disposal.

TOXIC - poisonous or directly harmful.

TURBIDITY - cloudiness of water from suspended material or particles. As the cloudiness increases, so does the turbidity; low turbidity indicates clear water and may be associated with good water quality.

WASTEWATER TREATMENT - processes that help remove solids, nutrients and other pollutants from water before it is discharged or reused.

WATER COLUMN - an inclusive term, covering the area that extends from the bottom sediments to the surface for the water in a lake, estuary or ocean.

WATERSHED - the geographic region that drains into a particular stream, river or body of water. The Tampa Bay watershed covers more than 2,200 square miles in six counties.

WETLAND - land where the water table is usually at or near the surface. Some wetlands contain water year-round; others may remain relatively dry for months, becoming moist only during periods of heavy rain. Wetlands are vital habitats for many species of plants and animals; they are protected by local, state and federal regulations.

ZOOPLANKTON - free-floating aquatic animals ranging in size from microscopic, single-celled organisms to large jellyfish. Zooplankton are an important source of food for many types of fish and animals.

ACRONYMS

ACP	AREA CONTINGENCY PLAN
AWT	ADVANCED WASTEWATER TREATMENT
BEMR	BIENNIAL ENVIRONMENTAL MONITORING REPORT
BMP	BEST MANAGEMENT PRACTICE
CARL	CONSERVATION AND RECREATION LANDS
CCMP	COMPREHENSIVE CONSERVATION & MANAGEMENT PLAN
CFMP	CRITICAL FISHERIES MONITORING PROGRAM
CIP	CAPITAL IMPROVEMENT PROGRAM
DDT	DICHLORODIPHENYL-TRICHLOROETHYLENE
DGPS	DIFFERENTIAL GLOBAL POSITIONING SYSTEM
DHRS	(Florida) DEPT. OF HEALTH AND REHABILITATIVE SERVICES
ELM	ENVIRONMENTAL LANDSCAPE MAINTENANCE
EPA	ENVIRONMENTAL PROTECTION AGENCY
EPC	ENVIRONMENTAL PROTECTION COMMISSION (HILLSBOROUGH COUNTY)
ERP	ENVIRONMENTAL RESOURCE PERMIT
FAC	FLORIDA ADMINISTRATIVE CODE
FADS	FLORIDA ATMOSPHERIC DEPOSITION SYSTEM
FCES	FLORIDA COOPERATIVE EXTENSION SERVICE
FDEP	FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
FDOT	FLORIDA DEPARTMENT OF TRANSPORTATION
FERC	FEDERAL ENERGY REGULATORY COMMISSION
FGFWFC	FLORIDA GAME AND FRESH WATER FISH COMMISSION
FMRI	FLORIDA MARINE RESEARCH INSTITUTE
FPC	FLORIDA POWER CORPORATION
FPL	FLORIDA POWER & LIGHT
FWPCA	FEDERAL WATER POLLUTION CONTROL ACT
FY	FISCAL YEAR
FY&N	FLORIDA YARDS AND NEIGHBORHOODS
GPS	GLOBAL POSITIONING SYSTEM
IMC	IMC-AGRICO
LTMS	LONG-TERM MANAGEMENT STRATEGY
MGD	MILLION GALLONS PER DAY
MSSW	MANAGEMENT AND STORAGE OF SURFACE WATERS
NOAA	NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION
NOEL	NO OBSERVABLE EFFECTS LEVEL
NOx	NITROGEN OXIDES
NPDES	NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM
NPL	NATIONAL PRIORITIES LIST
O & M	OPERATING AND MAINTENANCE (BUDGET)
OSDS	ON-SITE DISPOSAL SYSTEMS
PAH	POLYNUCLEAR AROMATIC HYDROCARBONS
PCB	POLYCHLORINATED BIPHENYLS
PEL	PROBABLE EFFECTS LEVEL
PORTS	PHYSICAL OCEANOGRAPHIC REAL-TIME SYSTEM
PRTF	POLLUTION RECOVERY TRUST FUND
RCRA	RESOURCE CONSERVATION & RECOVERY ACT
SWFWMD	SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
SWIM	SURFACE WATER IMPROVEMENT AND MANAGEMENT PROGRAM (SWFWMD)
TBNEP	TAMPA BAY NATIONAL ESTUARY PROGRAM
TBRPC	TAMPA BAY REGIONAL PLANNING COUNCIL
TECO	TAMPA ELECTRIC COMPANY
TKN	TOTAL KELDAHL NITROGEN
TN	TOTAL NITROGEN
TPA	TAMPA PORT AUTHORITY
TSS	TOTAL SUSPENDED SOLIDS
USACOE	UNITED STATES ARMY CORPS OF ENGINEERS
USDOT	UNITED STATES DEPARTMENT OF TRANSPORTATION
USEPA	UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
USF	UNIVERSITY OF SOUTH FLORIDA
UST	UNDERGROUND STORAGE TANKS
VTS	VESSEL TRACKING SYSTEM
WAFR	WASTEWATER FACILITY REGULATION DATABASE
WCRWSA	WEST COAST REGIONAL WATER SUPPLY AUTHORITY
WWTP	WASTEWATER TREATMENT PLANT

CHARTING THE COURSE CAPS FIVE YEARS OF SCIENTIFIC RESEARCH AND COMMUNITY OUTREACH BY THE TAMPA BAY NATIONAL ESTUARY PROGRAM (NEP), WHICH WAS ESTABLISHED IN 1991 TO ASSIST THE REGION IN DEVELOPING A COMPREHENSIVE PLAN FOR BAY RESTORATION AND PROTECTION.

ACTION PLANS FOR BAY IMPROVEMENT HAVE BEEN DEVELOPED WITH ASSISTANCE FROM BAY EXPERTS, ADVOCATES, COMMUNITY INTERESTS AND CITIZENS. RESIDENTS ATTENDED A SERIES OF TOWN MEETINGS ON TAMPA BAY IN THE SPRING OF 1996 TO DISCUSS THE DRAFT PLAN WITH PANELS OF EXPERTS FROM THEIR COMMUNITIES. THE NEP AND ITS CITIZEN ADVISORS ALSO CONDUCTED A SERIES OF SMALLER FOCUS GROUPS TO SOLICIT FEEDBACK FROM SPECIFIC INTEREST GROUPS.

THIS STRATEGIC BLUEPRINT REFLECTS BROAD-BASED INPUT FROM INDIVIDUALS, GROUPS AND COMMUNITIES THAT SHARE A COMMON INTEREST IN A HEALTHY BAY AS A CORNERSTONE OF A HEALTHY AND PROSPEROUS REGION.

CHARTING THE COURSE WAS PRODUCED BY THE TAMPA BAY NATIONAL ESTUARY PROGRAM, IN COOPERATION WITH THE U.S. ENVIRONMENTAL PROTECTION AGENCY AND LOCAL GOVERNMENT AND AGENCY PARTNERS.



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